

5-HYDROXYTRYPTAMINE IN THE LEAVES OF  
THE CROWN OF PINEAPPLE FRUIT [ANANAS  
COMOSUS (STICKM.) MERRILL]

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Several investigators have noted and studied the presence of serotonin and its precursors in fruits, mainly banana and tomato (Cartier, Moreau and Geffroy 1958; Waalkes, Sjoerdsma, Creveling, Weissbach and Udenfriend 1958; West 1959). The occurrence of serotonin in plants is not only of interest in the study of serotonin itself but is also of importance in avoiding a possible misdiagnosis of malignant carcinoid tumors since elevated 5-Hydroxyindoleacetic acid levels in a urine analysis may be the consequence of a diet rich in 5-Hydroxytryptamine or its precursors.

During the work on urinary 5-Hydroxyindoleacetic acid West (1960) and Bruce (1960 and 1961) noted unusually high peaks of excretion following the ingestion of pineapple juice. A more systematic study was conducted to determine the serotonin content in unripe fruit (60  $\gamma$ /g) and ripe fruit (19  $\gamma$ /g). A trace was also detected in stalks (0.2  $\gamma$ /g) but none in the leaves of the crown or base (Foy and Parratt 1961).

The present work investigated the occurrence of serotonin in green leaves of the crown of pineapple fruit. For this purpose leaves were homogenized in ethanol and extracted three times. The extract was concentrated under mild conditions (+ 33°C and 18 mm Hg). The plant pigments and lipophilic substances were removed by shaking the extract with petroleum ether. The extract was analysed chromatographically and we noticed two spots, one of which corresponds to tryptophan and the other to the biogenic amine — serotonin (Table).

For spectrophotometric and spectrophotofluorometric measurements the extract was passed through a column of ion exchanger Amberlite CG-50 in  $\text{NH}_4^+$  form. The ultraviolet absorption spectrum was measured on a Perkin Elmer apparatus. The acidic solution of the compound had a

Table

Rf values and colour reactions of compound from the leaves Pineapple and sample of 5-Hydroxytryptamine											
Substance	Paper chromatography Rf in solvent system					Thin layer chromatography	Reagents				
	1	2	3	4	5		I	II	III	IV	V
Compound from Pineapple	0.45	0.55	0.34	0.64	0.1	0.6	p-b	b	b	v	y-bn
5-Hydroxy-tryptamine	0.45	0.54	0.34	0.65	0.09	0.6	p-b	b	b	v	y-bn

1. n-BuOH-AcOH-H<sub>2</sub>O (60 : 15 : 25)2. iso-PropOH-NH<sub>3</sub>-H<sub>2</sub>O (10 : 1 : 1)3. n-BuOH-EtOH-H<sub>2</sub>O (4:1:1)4. MeOH-BuOH-C<sub>6</sub>H<sub>6</sub>-H<sub>2</sub>O (4 : 2 : 2 : 2)5. Dest. H<sub>2</sub>O6. iso-PropOH-NH<sub>3</sub>-EtAc (35 : 20 : 45)

I = Ehrlich

II = p-Dimethylamino-cinnamaldehyde

III = Xanthidrol

IV = 1-nitroso-2-naphthol

V = Ninhydrin-Acetic Acid

b = blue

v = violet

p-b = purple-blue

y-bn = yellow-brown

+ SiO<sub>2</sub>G

peak at 275 nm and a smaller one at 295 nm. This is in good agreement with the absorption characteristics previously reported for serotonin (Hamlin and Fischer 1951).

The acidic effluent was measured on a Farrand Mk-1 spectrophotofluorometer and we noticed a maximum at 550 nm with activating light at 295 nm. This is in agreement with data for excitation and emission maxima of 5-Hydroxyindole compounds. This measurements have shown that the leaves of the crown of pineapple fruit contain 17.2  $\gamma$  serotonin/g fresh weight.

### Summary

The leaves of the crown of Pineapple fruit were extracted with ethanol. The crude extract was purified with petroleum ether and passed through a column of Amberlite CG-50. The indole compound was investigated chromatographically and UV absorption spectrum (maxima at 275 nm and 295 nm), and fluorescence spectrum (550 nm when activated at 295 nm) were measured. On the basis of these data we conclude that the substance from the leaves of the crown is identical with an authentic sample of 5-Hydroxytryptamine and its quantity was 17.2  $\gamma$ /g fresh weight.

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## SADRŽAJ

### 5-HIDROKSITRIPTAMIN U LISTOVIMA KRUNE PLODA ANANASA [ANANAS COMOSUS (STICKM.) MERRILL]

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Listovi ananasa ekstrahirani su hladnim etilnim alkoholom. Ekstrakcija je ponovljena 3 puta, a trajala je 50 sati. Sveukupni ekstrakt je skoncentriran na mali volumen, uparavanjem pod blagim uvjetima (+33°C i 18 mm Hg). Koncentrat je propuštán preko kolone ionskog izmjenjivača amberlita CG-50. Organske kiseline i soli isprane su 0,02 M amonijevim acetatom, a bazna indolska supstancija 1 N solnom kiselinom. Kiseli eluat je zatim ispitivan kromatografijama na papiru i tankom sloju silika gela G, te mjeren apsorpcijski spektar u ultravioletu (maksimumi kod 275 nm i 295 nm) na aparatu Perkin Elmer i fluorescentni spektar (maksimum kod 550 nm, ako je aktivacija kod 295 nm) na aparatu Farrand Mk-1. Ustanovljeno je da supstancija iz listova po svim karakteristikama odgovara sintetskom 5-hidroksitriptaminu i da dolazi u količini od 17,2  $\gamma$ /g svježe tvari.

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